REMARKS

Claims 6-9 and 11-18 are canceled without prejudice. Claims 52-63 are added. Claims 1-5, 10, 19-63 remain in the application for consideration. In view of the following remarks, Applicant respectfully requests reconsideration and withdrawal of the rejections.

Objection To Color Drawings

The Office has objected to the color drawings which have been filed in the present application. The Office notes that the drawings are acceptable for examination purposes, but that a petition filed under 37 CFR 1.84(a)(2) or (b)(1) will be needed if the drawings are to be used as formal drawings. Applicant intends to submit formal drawings when the application is allowed.

Allowed and Allowable Subject Matter

Claims 29-45 are indicated by the Office as allowed. Applicant thanks the Office for the indication of allowable subject matter.

Additionally, **claims 6-9 and 11-18** are objected to as being dependent from a rejected base claim, but are otherwise allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. These claims have been canceled without prejudice and have been rewritten in independent form as new claims 52-63. Specifically, **claim 52** corresponds to claim 6 and includes the limitations from claims 5 and 1. **Claim 53** corresponds to claim 7 and depends from claim 52. **Claim 54** corresponds to claim 8 and includes the limitations from claims 5 and 1. **Claim 55** corresponds to claim 9 and depends from claim 55. **Claim 56** corresponds to claim 11 and includes the

limitations from claims 10 and 1. **Claim 57** corresponds to claim 12 and includes the limitations from claim 1. **Claims 58, 59 and 60** correspond to claims 13, 14, and 15 respectively, and depend from claim 57. **Claim 61** corresponds to claim 16 and includes the limitations from claim 1. **Claims 62 and 63** correspond to claims 17 and 18 respectively, and depend from claim 61.

As these claims constitute re-written versions of the previously-objected to claims, these claims should be summarily allowed.

§102 and 103 Rejections

Claims 19-28 stand rejected under 35 U.S.C. §102(e) over U.S. Patent No. 6,163,322 to LaChapelle.

Claims 1-5 stand rejected under 35 U.S.C. §103(a) over LaChapelle in view of U.S. Patent No. 6,351,269 to Georgiev.

Claim 10 stands rejected under 35 U.S.C. §103(a) over LaChapelle in view of Georgiev and a document to Parke entitled *Computer Facial Animation*.

Claims 46-51 stand rejected under 35 U.S.C. §103(a) over Parke in view of Georgiev.

Before undertaking a discussion of the substance of the Office's rejections, the following discussion of LaChapelle is provided in an attempt to help the Office appreciate various distinctions between the claimed embodiments that are rejected over LaChapelle and LaChapelle itself.

The LaChapelle Reference

LaChapelle discloses an animation system that is used in a facial animation system allowing a user to generate a facial animation sequence. LaChapelle's

process can be divided into five distinct stages namely actor motion; computation of displacement parameters; computation of weights; generation of animation model and display. As LaChapelle instructs, at each time frame t, a synthetic posture or expression of a face is constructed by obtaining a linear combination of data elements representative of basic facial expressions located in a database.

Exploring how this is done in more detail, LaChapelle instructs that the database is composed of basic expressions and comprises a so-called neutral expression E_0 and a set of n basic expressions. The n basic expressions are based on this neutral expression E_0. An example of a particular database of expressions appears in LaChapelle's Fig. 2. Notice the neutral expression E_0 appears in the upper left corner of the illustrated expressions.

Next, as instructed in column 9, lines 43-50, a registration stage occurs in which markers located on a live performer's face are mapped onto points on the neutral facial expression E_0 of the model in the synthetic coordinate space. LaChapelle refers to this projection as a "mapping template". As LaChapelle notes, this scaled projection forms the link between the synthetic character and the performer and allows transferring proper marker displacements to the system.

In a typical interaction, as instructed in LaChapelle, sets of markers on the performer's face are used to track the movements of the face of the performer. These markers are located at strategic positions to capture the global movements of the face. During the recording sequence, the performance actor moves his face in a desired fashion in order to supply motion information to the animation system. The specific motion is left to the discretion of the performance actor. At each frame, the movements of the physical markers are collected. By analyzing the

position of the markers from one frame to another, the marker displacement can be obtained.

As instructed in column 10, lines 26-40, an animated sequence can be obtained by constructing one facial expression for each time frame and interpolating the result for the time between frames. That is, the animation apparatus creates the desired expression E_f *corresponding to the motion of the markers* by using the set of n basic facial expressions and the neutral expression E_0 stored in the database of basic facial expressions. The data collected are displacement data indicative of a desired shift of position of the synthetic face through different expressions. Each frame of the displacement data forms the source data necessary to build the synthetic face corresponding to the facial expression characterized by the source data.

Following the motion of the actor, the displacement of the physical markers is mapped onto a displacement in the synthetic coordinate space. This is done by computing a displacement vector [e] from a reference. LaChapelle instructs that the neutral expression E_0 is used as the reference. The mapping template referred to above is used to translate the physical displacement of the markers into displacements in the synthetic coordinate space.

Next, as instructed in column 10, lines 66+, to generate the animation sequence, a number of weights are calculated and are assigned to each basic expression in the database to create the facial expression E_f.

The complete expression E_f is then constructed by computing the linear combination of the expressions in the database using the weights obtained. Finally, the synthetic model with the generated expression E_f can be generated and displayed to yield an animated sequence.

The Claims

Claim 1 recites a facial expression transformation method comprising:

- defining a code book containing data defining a first set of facial expressions of a first person;
- providing data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person;
- deriving a transformation function from the training set of expressions and corresponding expressions from the first set of expressions; and
- applying the transformation function to the first set of expressions to provide a synthetic set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle discloses the recited act of "defining" at column 4, lines 29-46, the recited act of "providing" at column 8, lines 22-25, and the recited act of "deriving" at column 9, lines 43-51. The Office then admits that LaChapelle does not disclose the recited act of "applying", but cites to Georgiev, column 4, lines 47-61 in support thereof. The Office then argues that it would be obvious to combine the cited material in LaChapelle with the material cited in Georgiev to render the claimed subject matter obvious. As motivation for making this combination, the Office states that it would "provide flexibility in modifying images."

Applicant respectfully disagrees with the Office and submits that the Office has not established a *prima facie* case of obviousness for a number of different reasons. First and foremost, the stated motivation for making this combination (and the other combinations in the present Office Action) is not stated with specificity and particularity, as it must be. *See, e.g., In Re Kotzab,* 217 F.3d 1365,

1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) ("*particular findings* must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed").

Assuming, for argument's sake alone, that LaChapelle and Georgiev disclose the features that the Office argues it does (which, as will be noted below, they do not), stating, as the Office does, that the combination would be obvious insofar as providing "flexibility in modifying images" is simply so broad and sweeping so as to cover any purported modification of LaChapelle. Accordingly, Applicant respectfully submits that the Office's stated motivation for combining these references is lacking in the kind of particular findings that it must have in order to make out a case of *prima facie* obviousness.

Notwithstanding the fact that the Office has failed to make out a *prima facie* case of obviousness, the Office's interpretation and application of the LaChapelle is misplaced and does not, as the Office contends it does, disclose the features that it is argued to disclose.

Preliminarily, however, it is unclear to Applicant what features in LaChapelle the Office assigns to Applicant's claim elements. This is because of a perceived ambiguity in the sections of the LaChapelle that the Office cites as disclosing the particular acts described above. There do appear to be two different interpretations that one might make:

(1) The Office considers LaChapelle's performer as the recited first person and the animated expressions as the recited second person; or

(2) The Office considers LaChapelle's animated expressions as the recited first person and the performer as the second person.

As a simple exercise in applying LaChapelle to claim 1, each of the individual interpretations above is applied to claim 1, by simply substituting LaChapelle's features for the recited claim features. Consider first interpretation (1) (i.e. LaChapelle's performer = the first person, and LaChapelle's animated figure = the second person):

> A facial expression transformation method comprising:
> defining a code book containing data defining a first set of facial expressions of a **[performer with markers on their face]**;
> providing data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a **[animated figure]** who is different from the **[performer with markers on their face]**;
> deriving a transformation function from the training set of expressions **[of the animated figure]** and corresponding expressions from the first set of expressions **[of the performer with markers on their face]**; and
> applying the transformation function to the first set of expressions **[of the performer with markers on their face]** to provide a synthetic set of expressions.

This interpretation does not seem to make any sense for a number of different reasons. First, an interpretation of LaChapelle which finds its animated figure providing a "training set of expressions" is logically inconsistent with LaChapelle. If anything, any training is conducted using the performer with markers on their face. See, e.g. column 9, lines 43-51 (i.e. defining the mapping template). Additionally, LaChapelle applies its transformation function to its animated figure, not the performer with markers on their face. So, with this

particular interpretation, LaChapelle clearly does not disclose the subject matter of this claim.

Now consider interpretation (2) (i.e. LaChapelle's performer = the second person, and LaChapelle's animated figure = the first person):

> A facial expression transformation method comprising:
> defining a code book containing data defining a first set of facial expressions of a **[animated figure]**;
> providing data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a **[performer with markers on their face]** who is different from the **[animated figure]**;
> deriving a transformation function from the training set of expressions **[of the performer with markers on their face]** and corresponding expressions from the first set of expressions **[of the animated figure]**; and
> applying the transformation function to the first set of expressions **[animated figure]** to provide a synthetic set of expressions.

Using this interpretation, it is apparent that LaChapelle does not disclose the features that the Office argues it does. First, LaChapelle does not disclose or suggest the act of "providing data defining a second set of facial expressions, *the second set of facial expressions providing a training set of expressions* of a second person who is different from the first person". That is, to the extent that LaChapelle discloses any training, it does so using only a single expression of the performer and not a *set* of expressions. For example, as noted in column 9, lines 43-51, registration mapping takes place using only the performer's face in a single position—its so-called natural position. Thus, it cannot be said that LaChapelle derives any transformation function from a *training set* of expressions and

corresponding *expressions* from a first set of expressions. Accordingly, for at least this reason, the Office's interpretation of LaChapelle is misplaced.

This being the case, LaChapelle cannot disclose or suggest the recited act of "applying", which the Office admits. The Office then relies on Georgiev and argues that it discloses applying a transformation function to a first set of expressions to provide a synthetic set of expressions, and cites to column 4, lines 47-61 for support. Applicant disagrees with the Office's application of this reference, particularly when viewed in light of LaChapelle.

Specifically, LaChapelle teaches that a desired expression is obtained by constructing a linear combination of the basic facial expressions in its database that best follows the displacements of the physical markers on a performer's face. Georgiev simply discloses, in the cited passage, transporting a facial expression of one person to another person using a so-called change vector. Specifically, as shown in Fig. 6, a change vector 301 is found that describes the change between a neutral face 300 and a smiling face 302 of the same person. This change vector 301 is then applied to a new face 304 to provide a smiling new face 306.

Applicant notes that this change vector (apparently considered by the Office as equivalent to the recited "transformation function") does not appear to be derived at all from a *training set* of expressions, as contemplated in the present claim. Rather, this change vector simply describes the change from a neutral face to a smiling face. As noted, the claim element that first introduces the transformation function recites "deriving a *transformation function* from the training set of expressions and *corresponding expressions* from the first set of expression." Georgiev does not appear to disclose or in any way suggest a method in which its change vector is derived from a training set of expressions and

corresponding expressions from a first set of expressions. This being the case, Georgiev cannot possibly disclose or suggest applying any such transformation function to a first set of expressions to provide a synthetic set of expressions.

This claim recites a transformation function that is derived in a specifically recited way. The Office is not free to ignore these specific recitations. Further, as noted above, neither LaChapelle nor Georgiev disclose or in any way suggest derivation of a *transformation function* as that term is understood in the context of the present claim and described in the specification. Accordingly, for at least this reason, this claim is allowable.

Claims 2-5 and 10 depend from claim 1 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 1, are neither disclosed nor suggested in the references of record, either singly or in combination with one another. Given the allowability of claim 1, the rejection of claim 10 over the combination that includes Parke is not seen to add anything of significance.

Claim 19 recites one or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, cause the computer to:

- operate on a training set of expressions from one person and corresponding expressions from a code book of another person to compute a linear transformation function from the training set and their corresponding expressions; and
- apply the transformation function to a plurality of expressions from the code book to provide a synthetic set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle discloses operating on a training set of expressions from one person and corresponding expressions from a code book of another person and cites to column 8, lines 22-25 and column 4, lines 29-46 in support therefor. In addition, the Office argues that LaChapelle discloses computing a linear transformation function from the training set of their corresponding expressions, citing to the mapping template discussed in column 9, lines 43-51 in support therefor. Applicant respectfully disagrees for at least the following reason. This claim recites its first element as "operate on a *training set of expressions* from one person and *corresponding expressions* from a code book of another person to compute a linear transformation function from the *training set and their corresponding expressions*". LaChapelle, on the other hand, simply maps points on a performer's face to a single neutral expression. Thus, LaChapelle does not utilize a *training set of expressions and their corresponding expressions* as specifically recited in this claim. In addition, the LaChapelle's mapping template is not a transformation function as that term is utilized in this claim and contemplated in Applicant's specification. Rather, the mapping template is simply a projection of the markers on the performer's face onto the neutral facial expression. LaChapelle's "transformation" occurs much later in the process.

Accordingly, for at least these reasons, this claim is not anticipated by LaChapelle.

Claims 20-23 depend from claim 19 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 19, are neither disclosed

nor suggested in the references of record, either singly or in combination with one another.

Claim 24 recites a facial expression transformation system comprising:

- a code book embodied on a computer-readable medium, the code book containing data defining a first set of facial expressions of a first person;
- data embodied on a computer-readable medium, the data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person; and
- a transformation processor configured to derive a transformation function from the training set of expressions and corresponding expressions from the first set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle discloses data defining a second set of facial expressions that provide a training set of expressions of a second person who is different from the first-recited person. In support of its position, the Office cites to column 8, line 22-25 and indicates that the database of expressions apparently meets this claim element. Applicant respectfully disagrees. LaChapelle's database of expressions does not constitute training expressions as that term is utilized in this claim. This is more apparent when one considers the claim's next element. Specifically, the next element recites "a transformation processor configured to *derive a transformation function from the training set of expressions and corresponding expressions from the first set of expressions*". LaChapelle does not derive any transformation function from a training *set* of expressions and *corresponding expressions* from a first set of expressions. In addition, LaChapelle's mapping template is not, as the Office contends, a derived transformation function. Rather, such constitutes only a

projection of markers on a performer's face onto points on a neutral facial expression. Accordingly, for at least this reason, this claim is not anticipated by LaChapelle.

Claims 25-28 depend from claim 24 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 24, are neither disclosed nor suggested in the references of record, either singly or in combination with one another.

Claim 46 recites a method of animating facial features comprising:

- defining a subdivision surface that approximates geometry of a plurality of different faces;
- fitting the same subdivision surface to each of the plurality of faces to establish a correspondence between the faces; and
- using the correspondence between the faces to transform an expression of one face into an expression of another face.

In making out the rejection of this claim, the Office argues that Parke discloses, on page 94 under the heading "Fixed Topology" a method of animating facial features comprising defining a subdivision surface that approximates geometry of a plurality of different faces. The Office admits that Parke does not disclose fitting the same subdivision surface to each of the plurality of faces to establish a correspondence between the faces and using the correspondence between the faces to transform an expression of one face into an expression of another face. Applicant agrees.

The Office then relies on Georgiev and cites to column 4, lines 47-61 as disclosing these elements. Applicant respectfully disagrees. The passage cited by

the Office simply describes a "change vector". Nowhere does Georgiev disclose or suggest that this "change vector" is a subdivision surface as that term is utilized in the present claim. In fact, the change vector is simply a vector that represents changes between pictures in what Georgiev calls "morph space". See, e.g. column 4, lines 11-45. Nowhere can Applicant find any disclosure in Georgiev that describes "fitting the *same* subdivision surface to each of the plurality of faces to *establish a correspondence between the faces*" and "*using the correspondence* between the faces to transform an expression of one face into an expression of another face." Accordingly, for at least this reason, this claim is allowable.

Claim 47 recites a method of animating facial features comprising:

- measuring 3-dimensional data for a plurality of different faces to provide corresponding face models;
- defining only one generic face model that is to be used to map to each corresponding face model;
- selecting a plurality of points on the generic face model that are to be mapped directly to corresponding points on each of the corresponding face models; and
- fitting the generic face model to each of the corresponding face models, said fitting comprising mapping each of the selected points directly to the corresponding points on each of the corresponding face models.

In making out the rejection of this claim, the Office argues that Parke discloses the first three recited acts in this claim. The Office then argues that Georgiev supplies the last element and cites to column 4, lines 47-61. The Office then argues that it would be obvious to incorporate Georgiev's method into Parke's method to "provide flexibility in modifying images". Applicant respectfully disagrees. First, the Office has failed to establish a *prima facie* case

of obviousness because the stated motivation for combining these references is so broad as to support any purported modification of Parke. Hence, the Office has not met its burden.

Additionally, Parke discloses, in the section entitled "Fixed Topology", a single topology that represents a "wide range" of individual faces. Parke does not disclose that the single topology is to be used to *map* to each corresponding face model, as that term is understood in the context of Applicant's disclosure. See, e.g. Specification page 23, line 9 through page 28, line 10. Accordingly, for at least this reason, Parke does not disclose what the Office contends it does.

Further, the Office's reliance on Georgiev is misplaced at best. Georgiev does not, as the Office contends, disclose or in any way suggest "fitting the generic face model to each of the corresponding face models, said fitting comprising mapping each of the selected points directly to the corresponding points on each of the corresponding face models." The passage cited by the Office simply describes change vectors which are discussed above. Applicant has studied Georgiev and can find no disclosure or suggestion of a generic face model, as that term is utilized in the present claim and Applicant's disclosure. Accordingly, for at least this additional reason, this claim is allowable.

Claims 48-51 depend from claim 47 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 47, are neither disclosed nor suggested in the references of record, either singly or in combination with one another.

Conclusion

All of the claims are in condition for allowance. Accordingly, Applicant requests a Notice of Allowability be issued forthwith. If the Office's next anticipated action is to be anything other than issuance of a Notice of Allowability, Applicant respectfully requests a telephone call for the purpose of scheduling an interview.

Respectfully Submitted,

Dated: 6/26/03

By: _____

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